

II. "On a Registering Spectroscope." By WILLIAM HUGGINS,  
LL.D., D.C.L., F.R.S. Received January 14, 1870.

The short duration of the totality of the solar eclipse of December last, led me to seek some method by which the positions of lines observed in the spectrum of the corona might be instantly registered without removing the eye from the instrument, so as to avoid the loss of time and fatigue to the eye of reading a micrometer-head, or the distraction of the attention and other inconveniences of an illuminated scale.

After consultation with the optician Mr. Grubb, it seemed that this object could be satisfactorily accomplished by fixing in the eyepiece of the spectroscope a pointer which could be moved along the spectrum by a quick-motion screw, together with some arrangement by which the position of this pointer, when brought into coincidence with a line, could be instantly registered.

I was furnished by Mr. Grubb with an instrument fulfilling these conditions, and also with a similar instrument with some modifications by Mr. Ladd, in time for the observation of the eclipse.

Unfortunately at my station at Oran, heavy clouds at the time of totality prevented their use on the corona; but they were found so convenient for the rapid registration of spectra, that it appears probable that similar instruments may be of service for other spectrum-observations.

In these instruments the small telescope of the spectroscope is fixed, and at its focus is a pointer which can be brought rapidly upon any part of the spectrum by a screw-head outside the telescope. The spectrum and pointer are viewed by a positive eyepiece which slides in front of the telescope, so that the part of the spectrum under observation can always be brought to the middle of the field of view. The arm carrying the pointer is connected by a lever with a second arm, to the end of which are attached two needles, so that these move over about two inches when the pointer is made to traverse the spectrum from the red to the violet. Under the extremity of the arm fitted with the needles is a frame containing a card, firmly held in it by two pins which pierce the card. This frame containing the card can be moved forward so as to bring in succession five different portions of the card under the points of the needles; on each of these portions of the card a spectrum can be registered.

The mode of using the instrument is obvious. By means of the screw-head at the side of the telescope, the pointer can be brought into coincidence with a line; a finger of the other hand is then pressed upon one of the needles at the end of the arm which traverses the card, and the position of the line is instantly recorded by a minute prick on the card. A bright line is distinguished from a dark line by pressing the finger on both needles, by which a second prick is made, immediately below the other. In all cases the position of the line is registered by the same needle, the second needle being used to denote that the line recorded is a bright one.

It was found that from ten to twelve Fraunhofer lines could be registered in about 15 seconds, and that, when the same lines were recorded five times in succession on the same card, no sensible difference of position could be detected between the pricks registering the same line in the several spectra.

It is obvious that, by registering the spectra of different substances on the card, a ready method is obtained of comparing the relative positions of the lines of their spectra.

Each spectroscope was furnished with a compound prism, which was made by Mr. Grubb, and gave a dispersion equal to about two prisms of dense glass with a refracting angle of 60°.

*Postscript.*—I have just learned that in a spectroscope contrived by Professor Winlock for observing the eclipse of December 22, 1870, the positions of the observing-telescope are registered by marks made upon a plate of silvered copper.—February 3, 1870.

February 23, 1871.

WILLIAM SPOTTISWOODE, M.A., Treasurer and Vice-President,  
in the Chair.

The following communications were read:—

I. “On the Mutual Relations of the Apex Cardiograph and the Radial Sphygmograph Trace.” By A. H. GARROD, of St. John’s College, Cambridge. Communicated by Dr. GARROD. Received January 18, 1871.

A desire to acquire an accurate knowledge of the relation borne by the commencing contraction of the heart to the origin of the primary rise in the pulse at the wrist, led the author to construct an instrument which has enabled him to determine, with considerable accuracy, the mutual relation of these two points, and to demonstrate one or two unexpected results, not altogether without interest.

The cardio-sphygmograph above mentioned consists of a piece of board, 10 inches long by  $5\frac{1}{2}$  inches broad, and about half an inch thick, along one side of which a sphygmograph can be laid, as shown in fig. 1. On the opposite side a spring (*a*) like that employed in the sphygmograph is attached to a moveable support (*b*), so that its tension can be modified. To the free end of the spring a small pad (*c*) is fixed, which is in communication with the cardiograph apparatus by means of a silk thread (*d*). This latter instrument consists of a light lever (*e*), a little over 2 inches long, connected to the board first mentioned by a frame (*f*) which is just free from the sphygmograph when the latter is in position. The lever, which is one of the third system, is connected on either side, close to its